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Solution by G. W. GREENWOOD, M. A., McKendree College, Lebanon, Ill.

$$f(x) \equiv (x-1)^4(ax^3+bx^2+cx+d)-1 \equiv (x+1)^4(a'x^3+b'x^2+c'x+d')+1.$$

Putting $-x$ for x and transposing we have

$$(x-1)^4(a'x^3-b'x^2+c'x-d')-1 \equiv (x+1)^4(ax^3-bx^2+cx-d)+1.$$

These identities are consistent if $a=a'$, $b=-b'$, $c=c'$, $d=-d'$.

By equating coefficients of the same powers of x in either identity, and solving the resulting equations we get $a=\frac{5}{16}$, $b=\frac{5}{4}$, $c=\frac{9}{16}$, $d=1$.

$$\therefore f(x) \equiv \frac{5}{16}x^7 - \frac{9}{16}x^5 + \frac{5}{16}x^3 - \frac{3}{16}x.$$

Also solved by R. D. Carmichael, A. H. Holmes, Henry Heaton, J. Scheffer, G. B. M. Zerr, and the Proposer.

211. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

*If $x=v^{1/(v-1)}$, what is the $f(x)$ such that $v=f(x)$?

Solution by G. B. M. ZERR, A. M., Ph. D., Parsons, W. Va.

Let $v=u+1$. Then $x^u=u+1$. Let $x=e^c$. $\therefore e^{cu}=u+1$. Let $cu=y$. $\therefore e^y=y/c+1$. $\therefore y=-c+ce^y$. If $y=a+b\varphi(y)$ we have by Lagrange's Theorem

$$y=a+b\varphi(a)+\frac{b^2}{2!}\cdot\frac{d}{da}[\varphi(a)]^2+\dots+\frac{b^n}{n!}\cdot\frac{d^{n-1}}{da^{n-1}}[\varphi(a)]^n+\dots \text{ etc.}$$

In this problem $\varphi(a)=e^a$.

$$\therefore y=-c+ce^{-c}+c^2e^{-2c}+\frac{c^3}{2!}e^{-3c}+\frac{c^4}{3!}e^{-4c}+\dots+\text{ etc.}$$

$$\therefore u+1=v=f(x)=e^{-c}+ce^{-2c}+\frac{c^2}{2!}e^{-3c}+\frac{c^3}{3!}e^{-4c}+\dots \quad c=\log_e x, \quad e^{-c}=1/x.$$

$$\therefore v=f(x)=1/x+\frac{\log_e x}{x^2}+\frac{(\log_e x)^2}{2!x^3}+\frac{(\log_e x)^3}{3!x^4}+\dots+\frac{(\log_e x)^n}{n!x^{n+1}}+\dots \text{ etc.}$$

$$\therefore v=f(x)=x^{(1-x)/x}.$$

GEOMETRY.

267. Proposed by W. W. LANDIS, Dickinson College, Carlisle, Pa.

Prove that every orthogonal system of circles in a plane is an isothermal system.

*This problem should admit of interesting generalizations, say for $x=v^{f(v)}$ for certain classes of functions f . G.